

pictures were made of pelicans on their nests by the Paget method. It was a rare opportunity and appreciated fully.

From the blind we also saw several Forster's Terns flying, a late Pintail duck's nest was afterward located near the pelican colony, and on the other side of the island was an attractive Blue-winged Teal's nest in the grass one hundred feet from shore, full of soft down and twelve eggs.

Of such interest was the bird life of Chase Lake and so successful the growth of its White Pelican colony from fifty birds in 1908 to at least 2500 in 1924, that it is hoped the reservation can continue to have the best of protection in the future. White Pelicans, Avocets and other birds, once so plentiful on the lakes of Iowa, Minnesota and the Dakotas, are now too uncommon to be overlooked in our conservation program. The Chase Lake Reservation has produced splendid results under a resident Federal game warden. It is hoped our good Biological Survey at Washington can continue to give it the best of attention as it has in the past, else the Middle West will lose its only remaining colony of nesting White Pelicans.

Our parting picture of this pelican colony was emblematic of this. It was a sunset scene with beautiful clouds, a colorful sky, and quiet water. At the shore many pelicans were silhouetted against the western light while above were outlines of a few flying birds, perhaps mindful of the dangers to their race, for the sunset time has come for the White Pelican of the middle western states.

SIoux CITY, IOWA.

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## COLOR REPRODUCTION OF BIRD ILLUSTRATIONS

BY HARRY G. LOTZ

[EDITOR'S NOTE. It is at our request that Mr. Lotz has prepared the following article on the process of reproducing bird paintings in color. It deals with a phase of ornithological technique which we ordinarily take for granted with little understanding.]

The bird artists of this country are relatively few in number, although during latter years the group has increased considerably. The artist who specializes in this work must make a life study of his subject in order to properly display his art and knowledge on paper through brush and color. He must know the anatomy of birds; and he must sense acutely the tints of the plumage that make birds such beautiful creatures. So it is also with the engraver, who takes the

artist's drawing and transfers it to metal for use in the printing press. In order to be proficient in this line the engraver must also make a study of this particular kind of work so that he may properly interpret the color and atmosphere that the artist has achieved.

When the illustration which is to be reproduced is placed in the hands of a photo-engraver, it is tacked on a large board in front of a process camera. A plate is then placed in the camera and a half-tone screen is placed between the lens and plate. When the exposure is made the screen, which contains 150 lines to the inch, will appear on the negative. Large arc lamps which produce an intense light are then flooded upon the copy for a few minutes, the length of time depending upon the color-tones of the subject. The lenses are very sensitive and play a great part in producing the half-tone negatives. Four negatives are thus made at exactly the same distance, through color filters, which separate the various colors. There is one negative for the yellow, one for the red, one for blue, and one for black. From these four colors practically all combinations of color and shade can be obtained by photo-engraving. The use of color filters make it possible to secure all of the value in each color eliminating the other three. In other words, when a yellow filter is used we get in the negative only the yellows which appear in the illustration. On account of the blending of the colors by the artist it is impossible to get an absolute separation and considerable work must be done by the color-etcher in giving certain color-tones their proper strength, as will be explained later in this article.

The four negatives are now developed and ready for the next step. Four pieces of highly polished copper, one-sixteenth of an inch thick and sensitized on one side with a special solution, and very carefully dried by heat, are placed firmly against the negatives in the manner in which photographic prints are made from films. The negative and copper plate are held firmly in contact by a printing frame made especially for this purpose. Powerful arc lights are again turned on. The light, which penetrates the transparent portion of the negative, comes in contact with the sensitized solution on the copper and transposes the design from the negative to the metal.

The copper plate is then taken from the frame and baked hard with intense heat. This forms a hard, enamel-like surface.

To the present point, an almost purely mechanical process takes place. The plates are now ready for the color-etcher who is the master-mind in color reproduction and usually supervises the entire work.

He must be an etcher and artist as well, since he, by means of brush and acid intensifies the lights and shadows by etching in order to faithfully interpret the artist's point of view. He has the illustration constantly before him. In order to successfully make color reproductions of birds, he must know their anatomy and be familiar with many details. It is for this reason that bird illustrations may be most faithfully reproduced by firms which specialize in this kind of work.

After the plates are etched, they are turned over to the engraver who by the use of fine tools cuts out the unnecessary parts, outlines the subject if necessary, and cuts away backgrounds. The occurrence of pure white in a color illustration is evidence that considerable hand engraving has been done, for if the four plates had been printed without the outlining, shades of color would show where the white appears. Many important parts of color reproduction depend upon the careful use of engravers' tools and engraving is a very essential branch of the work.

The plates now come to what is known as the routing and blocking room, where there are many types of machines. The "router" is used to cut away dead metal within the outer edge of the printing plate. The beveling machine is quite important, for it is accurately set to permit a flange on the edge of the plates which will permit tacking to the wood block, type high.

The plates now go to the proving department where each plate is printed, in its respective color, in ink. Each colored ink as it is on the plates is submitted to the etcher, for it is he who is responsible for the finished results. It is very important that each plate be printed in exact register. The fourth or last color to be printed does not always tell the final story, for there are many times when the color etcher, though he may have had many years of experience, goes amiss in his judgment of color-tones. However, the various colors may be modified greatly in securing the exact tone.

If color-engravings are to be made, it is essential that the original drawing or painting be exactly right before they are placed in the photo-engraver's hands, for it is too much to expect the engraver to make changes. If the copy is perfect before it goes into the engraver's hands it is then his task to produce a faithful reproduction of the original.

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